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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,381	09/26/2003	Hiroyuki Shioya	09812.0376-00000	8525

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EXAMINER	
NGUYEN, PHU K	
ART UNIT	**PAPER NUMBER**
2628	

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/672,381	SHIOYA, HIROYUKI	
	Examiner	Art Unit	
	Phu K. Nguyen	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

PHU K. NGUYEN
PRIMARY EXAMINER
GROUP 2300

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/11/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

The indicated allowability of claims 1-26 are is withdrawn in view of the newly discovered reference(s) to Kautz et al.. Rejections based on the newly cited reference(s) follow.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over LATTA et al. (Homomorphic Factorization of BRDF-based Lighting Computation) in view of KAUTZ et al. (Interactive Rendering with Arbitrary BRDFs using Separable Approximations).

As per claim 1, Latta teaches the claimed "image processing apparatus for finding reflectivity based on a BRDF model expressing a ratio of reflection of light incident upon one point of a surface of an object to be drawn at the object surface" (Latta, page 510, column 1, section 2.1 Texture based BRDF Approximation), comprising: "an operation means for calculating said reflectivity based on a BRDF model calculated by a matrix expression including a vector comprised of a light source

direction vector, a viewpoint direction vector, and a normal direction vector and a matrix determining the characteristics of the BRDF model" (Latta, page 510, column 2, line 32 to page 511, column 1, line 6). It is well known in mathematical calculation, the approximation of BRDF lighting function can be taken in many forms (Latta, section 3.1 Approximation; page 511, column 1) of matrices for a trade off of complexity of calculation and processing time; however, Latta does not teach that the reflextivity matrix is a "quadratic-form" matrix as claimed. Kautz teaches that the integral calculation in bidirectional reflectance distribution (BRDF) is approximately generated by the square/quadratic matrix in the computer (Kautz, section 4.1, Singular Value Decomposition, page 4). Therefore, it would have been obvious, in view of Kautz teaching, to configure Latta's system as claimed because the motivation for using a "quadratic-form" matrix is based on an acceptable view of approximation and processing time.

Claim 2 adds into claim 1 "said vector comprised of the light source direction, the viewpoint direction, and the normal direction is either of a three-dimensional vector expressing directions, a quaternion, and a pole coordinate" (Latta, page 510, column 2, line 32 to page 511, column 1, line 6).

Claim 3 adds into claim 1 "said vector comprised of the light source direction, the viewpoint direction, and the normal direction is obtained by regressing the order by using an appropriate linear conversion" which Latta does not explicitly teach. However,

such implementation of matrix calculation would have been obvious for the simplification of calculation using linear conversion (Kautz, section 4, Decomposition, page 3). Therefore, it would have been obvious, in view of Kautz teaching, to configure Latta's system as claimed because the motivation of using linear conversion is the reduction of calculation time due to a fast conversion rate.

Claim 4 adds into claim 1 "said vector comprised of the light source direction, the viewpoint direction, and the normal direction is obtained by converting these vectors by any elementary operation, table reference, or combination of the same" which Latta does not explicitly teach. However, such implementation of matrix calculation would have been obvious for the simplification of calculation using elementary operations (Kautz, section 4.1, Singular Value Decomposition, page 4). Therefore, it would have been obvious, in view of Kautz teaching, to configure Latta's system as claimed because the motivation of using elementary operations is the reduction of calculation time due to perform simple operations.

Similarly, although Latta does not explicitly teach the calculation teachniques used in claims 5-8; however, those claimed techniques are well known in simplification of matrix calculations (Kautz, section 4, Decomposition, page 3). Therefore, it would have been obvious, in view of Kautz teaching, to configure Latta's system as claimed because the motivation of implement the matrix calculation by the claimed techniques is

the reduction of calculation time due to perform simpler operations.

Claim 9 adds into claim 1 "using a texture map" (Latta, page 513, column 2, lines 1-30).

Claim 10 adds into claim 1 "predetermined filtering" (Latta, page 510, column 1, section 2.2 Prefiltering).

Claim 11 adds into claim 10 "an indexed table" which Latta does not explicitly teach. However, such implementation of matrix calculation using an index table would have been obvious for the simplification of calculation. The motivation of using index table is the reduction of calculation time due to perform look up operations.

Claim 12 adds into claim 1 "said operation means obtains the matrix determining the characteristics of the BRDF model by solving an equation comprised of a plurality of polynomials obtained by entering a plurality of BRDF raw data given in advance into said BRDF model" (Latta, page 511, column 1, section 3.1 Approximation).

Claim 13 adds into claim 1 "said operation means forms the matrix determining the characteristics of the BRDF model from the parameters of a polynomial texture map by a correspondence obtained by assuming that a diffuse reflectivity distribution

corresponding to the light source direction is the same as a specular reflectivity distribution corresponding to a half vector direction" (Latta, page 513, column 2, lines 10-32).

Claim 14-26 claim a method based on the apparatus of claims 1-13, therefore, they are rejected under the same reason.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phu K. Nguyen whose telephone number is (571) 272 7645. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Razavi can be reached on (571) 272 7664. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Phu K. Nguyen
November 27, 2006

PHU K. NGUYEN
PRIMARY EXAMINER
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